

What is claimed is:

- 1 1. A comparator unit comprising:
2 a first amplifier stage including a differential amplifier having a pair of input
3 nodes and a pair of output nodes, a switch connected across the pair of output nodes, and
4 a non-linear load connected across the pair of output nodes; and
5 a second amplifier stage coupled to the pair of output nodes.
- 1 2. The comparator unit of claim 1, wherein the differential amplifier comprises a
2 pair of differential pairs of isolated gate field-effect transistors.
- 1 3. The comparator unit of claim 2, wherein the switch comprises an electronically
2 controllable switch.
- 1 4. The comparator unit of claim 3, wherein the electronically controllable switch
2 comprises an isolated gate field-effect transistor.
- 1 5. The comparator unit of claim 4, wherein the non-linear load comprises a pair of
2 cross-coupled isolated gate field-effect transistors.
- 1 6. The comparator unit of claim 5, wherein each transistor in the pair of cross-
2 coupled isolated gate field-effect transistors comprises an *n*-channel isolated gate field-
3 effect transistor.
- 1 7. The comparator unit of claim 1, wherein the second amplifier stage comprises a
2 non-linear amplifier.
- 1 8. The comparator unit of claim 2, wherein the second amplifier stage includes a pair
2 of second stage output nodes and a switch connected across the pair of second stage
3 output nodes.

1 9. The comparator unit of claim 1, wherein the differential amplifier comprises a
2 differential pair of isolated gate field-effect transistors.

1 10. A comparator unit comprising:
2 a first amplifier stage including a differential amplifier having a pair of input
3 nodes and a pair of output nodes including a first output node and a second output node, a
4 non-linear load connected across the pair of output nodes, and a first switch connected
5 between the first output node and a common node and a second switch connected
6 between the second output node and the common node; and
7 a second amplifier stage coupled to the pair of output nodes.

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9 11. The comparator unit of claim 10, wherein the differential amplifier comprises a
10 pair of differential pairs of isolated gate field-effect transistors.

1 12. The comparator unit of claim 11, wherein the switch comprises an optically
2 controllable switch.

1 13. The comparator unit of claim 12, wherein the optically controllable switch
2 comprises a photo-transistor.

1 14. The comparator unit of claim 13, wherein the non-linear load comprises a pair of
2 cross-coupled bipolar transistors.

1 15. The comparator unit of claim 14, wherein the second amplifier stage comprises a
2 non-linear amplifier.

1 16. The comparator unit of claim 15, wherein the non-linear amplifier includes a pair
2 of second stage output nodes and a switch connected across the pair of second stage
3 output nodes.

1 17. The comparator unit of 16, wherein the non-linear amplifier includes a pair of
2 cross-coupled *p*-channel isolated gate field-effect transistors connected across the pair of
3 second stage output nodes, a non-linear load connected across the pair of second stage
4 output nodes, and a pair of input transistors connected across the non-linear load.

1 18. A signal transmission unit comprising:
2 a differential signal source;
3 a comparator unit comprising:
4 a first amplifier stage including a pair of differential amplifiers having a
5 pair of input nodes and a pair of output nodes, a switch connected across the pair
6 of output nodes, and a non-linear load connected across the pair of output nodes;
7 and
8 a second amplifier stage coupled to the pair of output nodes; and
9 a transmission line to couple the differential signal source to the comparator unit.

1 19. The signal transmission unit of claim 18, wherein the differential signal source is
2 formed on a first integrated circuit die, the comparator unit is formed on a second
3 integrated circuit die, and the transmission line is formed on a substrate on which the first
4 integrated circuit die and the second integrated circuit die are mounted.

1 20. The signal transmission unit of claim 19, wherein the second integrated circuit die
2 comprises a processor.

1 21. The signal transmission unit of claim 20, wherein the first integrated circuit die
2 comprises a communication unit.

1 22. The signal transmission unit of claim 20, wherein the first integrated circuit die
2 comprises a data storage unit.

1 23. The signal transmission unit of claim 20, wherein the first integrated circuit die
2 comprises an amplifier.

1 24. A method of processing a differential signal, the method comprising:
2 beginning an equalization phase in a first amplifier stage;
3 beginning an equalization phase in a second amplifier stage about one gate delay
4 after beginning the equalization phase in the first amplifier stage;
5 evaluating the differential signal in the first amplifier stage to form a first stage
6 output differential signal after completing the equalization phase in the first amplifier
7 stage; and
8 evaluating the first stage output differential signal in the second amplifier stage
9 after completing the equalization phase in the second amplifier stage.

1 25. The method of claim 24, wherein beginning an equalization phase in a first
2 amplifier stage comprises:
3 closing a switch in the first amplifier stage.

1 26. The method of claim 24, wherein beginning an equalization phase in a first
2 amplifier stage comprises:
3 closing a plurality of switches in the first amplifier stage.

1 27. The method of claim 26, wherein evaluating the differential signal in the first
2 amplifier stage to form a first stage output differential signal after completing the
3 equalization phase in the first amplifier stage comprises:
4 applying linear amplification to the differential signal to form an amplified
5 differential signal; and
6 applying non-linear amplification to the amplified differential signal to form the
7 first stage output differential signal.

1 28. The method of claim 27, wherein evaluating the first stage output differential

- 2 signal in the second amplifier stage after completing the equalization phase in the second
- 3 amplifier stage comprises:
- 4 applying non-linear amplification to the first stage output signal.